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Entry Deterrence and the Calculation of the Net Cost of Universal Service Obligations

Christian Jaag

Abstract

This paper relates to the current discussion about how to measure the net cost and the unfair burden of universal service provision in network industries. The established profitability cost approach compares the profit of a universal service provider (USP) with and without a universal service obligation (USO). This paper argues that the net cost of universal service provision critically depends on the regulatory counterfactual and hence the USP's strategy space without USO. On the one hand, a strong USO limits the USP's means to position itself in the market, which offers cream-skimming opportunities and invites competition. On the other hand, a simple game-theoretic entry analysis shows that the USO may effectively serve as a valuable strategic commitment device to deter entry. Hence, the USO may be valuable to the USP despite causing inefficient operations. From a policy perspective, this constitutes a counter-intuitive result for the definition of the USO: the stricter it is regulated, the more detrimental it may be to competition and, therefore, the smaller is its burden on the USP.

KEYWORDS: universal service obligation, network industries, market entry, entry deterrence, net cost

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1 Introduction

Many network industries used to be dominated by state-owned monopolies coupled with rate of return regulations. During the past twenty years, governments in many parts of the world have started liberalizing network industries, e.g. telecommunications, postal services, electricity, and transport. This liberalization process started in the United States in the late 1970s and in the United Kingdom in the early 1980s. Since then, sectors such as telecommunications and air transport have become fully liberalized in the European Union and are becoming increasingly competitive. The electricity sector, postal services, and railways are not yet fully liberalized. A common issue in network industries is the existence of a universal service obligation (USO) which traditionally has been financed by reserved areas (legal monopolies). After liberalization, it becomes an important question, what the net cost and the financial burden of the USO exactly is.

There are several reasons why governments and regulators may want to introduce or maintain universal services: Equity, economic development and efficiency in the case of market failure, such as network externalities.[1] The standard argument for uniform pricing – which is often an important aspect of the USO – is that it reduces the transaction costs for customers.[2] This argument now applies mostly to small customers, where the transaction costs resulting from non-uniform pricing would be significant. There have been recent proposals to relax the uniform pricing constraint of the traditional USO, e.g. Crew and Kleindorfer (2007) in the postal sector. These proposals are directed not only toward single-piece letters, but also toward bulk mail originating from large mailers which are subject to uniform tariffs resulting from worksharing discounts based on avoided cost.

All binding universal service obligations cause a direct net cost to their provider as they interfere with its business strategy. To be compensated for the associated burden, many universal service providers (USPs) have traditionally benefited from a reserved area. Crew and Kleindorfer (1998) develop the optimum size of monopoly in the postal sector to allow the USP to break even when providing universal services. Due to recent steps toward liberalized markets the need for alternative funding sources has emerged. Therefore, it has become important for regulators and the public to know the cost of universal service provision.

In recent years, many contributions have been published on the issue of how to calculate the ‘net cost’ or ‘burden’ of the universal service obligation. Panzar (2000) and Cremer et al. (2000) provide a theoretical foundation for the

[1] See Cremer et al. (1998, 2008).
[2] See e.g. Crew and Kleindorfer (1998).

so-called profitability cost approach. This approach compares a firm's profit level in a liberalized market with and without the USO. In order to derive the net cost, a benchmark scenario must be specified in which a firm faces no binding constraint regarding the services it offers. The net incremental cost of universal service provision is equivalent to the difference in total cost less the additional revenue. The difference in total cost results from the total cost after the universal service obligation's introduction less the total cost in the benchmark scenario. The additional revenue with the USO is equal to the revenue from those market segments which are served only after the introduction of the universal service obligation. Without the USO, a firm can offer individual services at prices which are higher than specified by the universal service obligation. The introduction of a universal service obligation causes the firm to incur losses whenever the lower prices are not compensated by the increased demand. These losses are foregone revenue. The sum of the net incremental cost and foregone revenue equals the profitability cost. This approach has already been practically implemented in the postal sector in a number of countries, e.g. in Denmark (Copenhagen Economics, 2008), Norway (Bergum, 2008), in the UK (Frontier Economics, 2008), and in the US (Cohen et al., 2010).

In 2008, the European Parliament issued the Third Postal Directive (2008/6/EC). Annex I gives the Member States guidance as for how to calculate the net cost of universal service obligations: [3]

> "The net cost of universal service obligations is to be calculated, as the difference between the net cost for a designated universal service provider of operating with the universal service obligations and the same postal service provider operating without the universal service obligations."

If policy makers compensate the USP by this difference, it achieves the same profit as it would in the postal market without any obligations. This does not automatically imply that there is an unfair burden associated with universal service provision.[4] The profitability cost approach together with the concept of an 'unfair burden' is supposed to determine the compensation that makes the designated USP indifferent whether to provide the USO or not. It has often been pointed out that in practice it is hard to define what the difference between the USO and non-

[3] Directive 2008/6/EC of the European Parliament and of the Council, Annex I. The Third Postal Directive follows the Universal Service Directive (2002/22/EC) concerning the telecommunications market in this respect.

[4] For a discussion of various possible definitions of an unfair burden, see Boldron et al. (2009) or Jaag (2010).

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USO profit levels is, as one of the scenarios is counterfactual and not observable, even ex post.

In this paper we show that the net cost of the USO and the burden of universal service provision depends not only on the counterfactual competitive scenario but also on the regulatory benchmark regime: If there is no USO at all in the alternative scenario, the USP's strategy is different from the one in a situation in which another firm is bound by universal service constraints.

Our model approach is similar to Valletti et al. (2002) who analyze the strategic effects of regulatory interventions such as uniform pricing and coverage constraints. In their model with two operating firms, there are several regions with either both, one or zero firms operating in equilibrium. They assume that there is an incumbent which is the designated USP and therefore automatically the bigger one of the two firms. They find that a welfare evaluation of USO policies should take into account the interaction of various aspects of the USO and between different market segments or areas. Also, Boldron et al. (2008) argue that the market structure and the actual cost/burden of USO are directly related to regulation and the funding mechanism in place. Similar points are raised in Jaag and Trinkner (2011) and Borsenberger et al. (2010). Hence, the cost of universal service provision under competition differs from the monopoly case and competitive interaction must be taken into account: A strong USO invites competition by limiting the USP's means to position itself in the market and by offering cream-skimming opportunities to competing operators.

We extend these analyses by explicitly discussing the interaction of the regulatory environment, the operating firms' strategies and the cost of universal service provision.[5] We hence not only take into account competitive interaction in the market, but also competition for the market. Our paper is therefore related to the game-theoretic literature on market entry deterrence pioneered by Spence (1977) and Dixit (1980). They show that incumbents can credibly commit to aggressive behavior to deter potential competitors from entering by building extra capacity to lower average cost. In the case that the cost of capacity is sunk, the threat to lower prices if entry occurs is credible.

Fudenberg and Tirole (1984) argue that the less the incumbent's cost depends on output, the greater is its ability to deter entry. Therefore, potential entry may bias its choice of technology towards capacity-intensive production modes. In addition, it may opt for long-term labor contracts that specify rigid wages with a minimum of temporary layoffs and variability of hours. Consequently, the in-

[5] Recent attempts to actually calculate the cost of universal service provision fall short of these insights by not considering the interaction between various USO dimensions and by not defining the regulatory alternative; see Boldron et al. (2006), Bradley et al. (2008), and Copenhagen Economics (2008). Jaag et al. (2009) account for interactions between USO dimensions by advocating a 'global approach'. However, they do not define the regulatory alternative, either.

cumbent is less able to adapt to successful entry. This argument implies that an incumbent's successful business strategy depends on the characteristic of the markets in which it is operating:

- If successful entry is likely in a market segment, it is important to have a flexible cost structure in order to be able to cope with competition.
- If a market is likely to be served by only one firm in equilibrium, it is sensible to have a more rigid cost structure and to sink costs in order to deter entry by credibly committing to act aggressively.

Gilbert and Vives (1986) extend the Spence-Dixit models to consider multiple incumbents; Rasmussen (1988) augments them by allowing the incumbent to "buy out" the entrant. He shows that the Spence-Dixit result is only valid if the incumbent can commit not to acquire the entrant. This literature shows that the most important ingredient to entry deterrence is a credible threat to behave aggressively. Such a threat typically involves an investment, e.g. in capacity, which is inefficient and costly to the incumbent firm.

In the context of the model we discuss below, successful entry deterrence implies for an operator to credibly commit to operate in certain market segments or regions. While a universal service obligation usually also causes additional cost, it may be a comparably cost-effective tool to commit.[6] In such a situation, the net cost of the USO to the universal service provider may be negative even though it entails inefficient operation.

2 The Model

Our model serves to discuss the strategic effects of a universal service obligation in liberalized markets. For simplicity, we assume here that the USO simply consists of a coverage constraint which obliges the USP to offer services in all regions of a country.

2.1 Markets and Entry Decisions

As in Valletti et al (2002), there are two firms, an incumbent *I* and an entrant *E*. Each firm offers one type of product or service which are imperfect substitutes. They operate in a continuum *[0,1]* of independent markets.[7] Each market is of

[6] Fudenberg and Tirole (2000) argue that also the installed user base of a network good can serve a preemptive function which is similar to that of an investment in capacity.

[7] In real markets, there may be economies of scope between different regions (see e.g. Panzar, 2008, for the postal sector). However, they affect only the size of profits (through reduced incre-

equal size, but markets are ordered by fixed costs. If a firm decides to enter a market at location x, it incurs fixed costs $c(x)$ where $c(0)=0$ and $c'(x)>0$. Each firm starts entering markets from the least expensive location and leaves no gaps between served locations.

We denote by $r(x)$ the incremental surplus for a firm obtained at location x which we assume to be positive at all locations.[8] It is higher if only one firm operates in a market than in a situation with two operators. Gross profit is $\pi(x)=\int r(x)-c(x)dx$ over the markets which are served. For simplicity, we assume symmetry between both firms in terms of cost and revenues in each market x. Further, we assume that demand and cost characteristics are such that all markets belong to one of the three following regions:

- In region D, competition results in positive profit for both operators.
- In low-cost region L, a firm's profit is positive only if it is operating as a monopoly.
- In high-cost region H, not even a monopolist is able to cover its fixed costs because these are too high.

Note that whether or not duopoly profits for one or both operators are negative is hence given by the definition of the regions.

In the following discussion, we neglect profits in region D and consider only regions L and H.[9] A firm's profit in region i is $\pi_{i,M}$ if the region is served by only one firm and $\pi_{i,D}$ if it is served by both firms. Fixed costs in region i are denoted by c_i. For simplicity, we assume that payoffs in each of the regions are symmetric between firms.[10] The above definitions imply that $\pi_{L,D}<0<\pi_{L,M}$ and $\pi_{H,D}<\pi_{H,M}<0$.

The market structure which we simply assume here results from competition as modeled by Valletti et al. (2002) and Jaag and Trinkner (2011). In contrast to their analysis, however, we do not assume that the incumbent is always the bigger firm operating in the monopoly region L. It is the strategic interaction be-

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mental costs of entering additional markets), but not the profits' signs. Also, the ordering of profits in different regions will not be affected. Therefore, the model assumption that there are no economies of scope does not result in a loss of generality of our results. The only exemption is the equilibrium in mixed strategies discussed in Footnote 19 where the probability of serving a region depends on relative profit levels.

[8] The surplus is defined as the difference between revenues and variable costs.

[9] This is not critical for the analysis as profits in region D are irrelevant for the operators' strategic decisions if the compensation for an unfair burden is exogenous, which is the case in our setting. Jaag and Trinkner (2011) relax this assumption.

[10] In reality, they may differ for the two firms due to sequential decisions or due to strategic links between markets induced e.g. by a price uniformity constraint as part of the USO. However, this simplifying assumption does not alter payoff-structures decisively.

tween the two firms that determines which operator finally is the bigger one, such that firm size is endogenous in our setting.

We analyze the equilibria of the market entry game in various regulatory regimes and assuming the assignment of the USO to one of the two operators as given. Note that we do not explicitly model the effect of USO payments on the equilibrium outcomes of our model. In case the USP is compensated by public funds, this is straightforward, as there is no interaction with the operators' market strategies. However, a USO fund and operators' contributions to it may significantly alter the equilibrium outcomes. It would go beyond the scope of this paper to discuss these effects in detail. We refer to Jaag and Trinkner (2011) and Jaag (2010) who discuss the interaction of USO costing and financing and the effect of the financing on the resulting financial burden, respectively.

2.2 Sequential Entry

In this section we treat the incumbent and the entrant asymmetrically, assuming that the incumbent decides first about its market coverage. The relevant question is whether firms choose to be present in region *L* where profits result only if there are no other firms in the markets. The most generic situation is competition with both the incumbent and the entrant being free to choose either to operate in that market or not, i.e. there is neither a reserved area nor universal service obligation. Figure 1 shows the decision tree in this setting. The incumbent *I* decides first. Its possible actions are staying in the market (*s*) and abandon it (*a*). The entrant *E* decides second; its feasible actions are entering the market (*e*) or not (*n*). Hence, in this general setting, the incumbent's strategy set is $S^I = \{\{s\},\{a\}\}$, while the entrant's strategy set is $S^E = \{\{e,e\},\{e,n\},\{n,e\},\{n,n\}\}$. The payoffs following the terminal nodes depend on the nature of the fixed costs and the regulatory scenario. They are reported in the four rows in Table 1, Table 2 and Table 3, respectively. The payoffs account for the assumption that the Incumbent used to be the USP in the past.

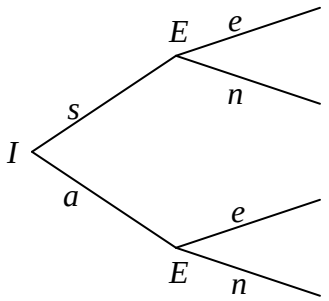

Figure 1: Sequential entry in region *L* (payoffs are given in Table 1, Table 2 and Table 3).

There are four different potential outcomes/equilibria in pure strategies of this entry game. The resulting profits are given in Table 1, Table 2 and Table 3 in the column "Competition / no USO" as a benchmark for the comparison with scenarios including USO. The subgame-perfect Nash-equilibrium in pure strategies for each regulatory scenario is highlighted by a bold typeface.

As another reference, we also show the outcomes in a situation with a legal monopoly in which only the incumbent is allowed to operate in the market. In the following, we discuss two different cases resulting from different assumptions on the nature of the fixed costs: In Section 2.2.1 we assume fixed costs to be predetermined in the sense that investments from the past are irreversible and cause depreciation costs irrespective of whether they are still needed in the firm's operations.[11] In Section 2.2.2 we assume that the spending of all fixed cost is determined continuously.[12]

2.2.1 Predetermined Fixed Costs

The payoffs for scenarios in which fixed costs are entirely predetermined are given in Table 1 and in Table 2. [13] Each of the four rows shows the payoff following a terminal node in Figure 1. The columns represent regulatory scenarios. The sequence of entry is of great importance in all regulatory scenarios. Recall that we assume that the incumbent has offered universal services traditionally and before the USO is newly assigned to one of the operators. Then, the incumbent operator's cost would not be reduced by abandoning region *L* in case the USO is removed. Hence, staying is a dominant strategy, because this will result in positive revenues and hence a profit that is greater than without any revenues. The incumbent will even stay in region *H* because all fixed costs are predetermined and producer's surplus is positive in all locations.

[11] Examples for predetermined fixed costs are investments in telecommunications or railway infrastructures.

[12] These are two extreme cases which delimit the range of possible situations.

[13] The following example illustrates how Figure 1 can be read in conjunction with Table 1: In the regulatory scenario with a legal monopoly and no USO, the payoffs resulting from *({a},{n,n})* are *($-c_L$-c_H,0)*.

	Legal monopoly no USO	*I* is USP
({s},{e,e}) *({s},{e,n})*	n/a	n/a
({s},{n,e}) *({s},{n,n})*	$(\pi_{L,M}+\pi_{H,M},0)$	$(\pi_{L,M}+\pi_{H,M},0)$
({a},{e,e}) *({a},{n,e})*	n/a	n/a
({a},{e,n}) *({a},{n,n})*	$(-c_L-c_H,0)$	n/a

Table 1: Payoffs in regions *L* and *H* with sequential entry and predetermined fixed costs in the monopoly case.[14]

	Competition no USO	*I* is USP	*E* is USP
({s},{e,e}) *({s},{e,n})*	$(\pi_{L,D}+\pi_{H,M},\pi_{L,D})$	$(\pi_{L,D}+\pi_{H,M},\ \pi_{L,D})$	$(\pi_{L,D}+\pi_{H,D},\pi_{L,D}+\pi_{H,D})$
({s},{n,e}) *({s},{n,n})*	$(\pi_{L,M}+\pi_{H,M},0)$	$(\pi_{L,M}+\pi_{H,M},0)$	n/a
({a},{e,e}) *({a},{n,e})*	$(-c_L-c_H,\pi_{L,M})$	n/a	$(-c_L-c_H,\pi_{L,M}+\pi_{H,M})$
({a},{e,n}) *({a},{n,n})*	$(-c_L-c_H,0)$	n/a	n/a

Table 2: Payoffs in regions *L* and *H* with sequential entry and predetermined fixed costs in the competition case.

The equilibrium in the scenario in which the incumbent is obliged to continue providing universal services (scenario "Competition – *I* is USP") is the same as in the scenario "Competition – no USO": The incumbent serves all regions and the entrant will neither serve region *L* nor region *H*. The profitability cost approach calls for a comparison of the USP's profit level with and without USO. The resulting net cost of the USO depends on whether there is a USO in the regulatory alternative. Hence, it is not sufficiently defined without knowing the counterfactual regulatory scenario:

- Compared to a situation without any USO, the scenario "Competition / *I* is USP" results in zero net cost (compare the equilibrium payoffs in Table 1 "Competition no USO" and "Competition / *I* is USP") because there are no incentives for the traditional USP to change the scope of its

[14] The entry n/a means that such an outcome is not feasible due to the definition of the regulatory scenario: With a legal monopoly, *E*'s market entry is not possible. In case there is a USO, the USP is obliged to operate in all markets.

operations without USO.[15] There may be a burden resulting from inefficient operations. However, it does not result from the current USO but from the USO in the past.[16]

- Compared to a situation in which the entrant is the USP, the net cost is $-\pi_{L,M}-\pi_{H,M}+\pi_{L,D}+\pi_{H,D}$, which is negative: If the entrant was the USP, instead of monopoly profits the incumbent would just make duopoly profits all regions.

If the entrant is the designated USP, the net cost of the USO is $-\pi_{L,D}-\pi_{H,D}>0$. Hence, (hypothetically) tendering the USO would result in the entrant requiring $\pi_{L,D}+\pi_{H,D}$ as a compensation if it wins the USO contract. Compared to being the USP himself, the incumbent would be worse off in this situation because of competition in region L. Hence, it would be willing to pay $\pi_{L,M}+\pi_{H,M}-\pi_{L,D}-\pi_{H,D}$ in order to avoid that outcome. As a result, USO tendering would end up in the incumbent being the USP with low or even negative compensation because there would be no positive net cost and therefore no unfair burden.

The current legislation in the Swiss telecommunications market can be understood in light of the above considerations. Resulting from a public call for tenders for the award of a universal service license, the Federal Communications Commission has designated Swisscom (the incumbent operator) as the USP from 2008 onwards. For ten years, Swisscom will be obliged to provide universal services in the telecommunications sector to all sections of the population and in all regions of the country. The new license obliges Swisscom to provide a broadband internet connection in addition to analogue and digital telephone connections. All services are subject to a price cap and a specific level of quality. In particular, the universal service in Switzerland will incorporate a broadband internet connection for all households. This is worldwide unique.

Swisscom had almost full coverage for broadband connections before the USO tender. As most of the investment cost is predetermined once broadband connections have been set up, the net cost of universal service provision for the incumbent is very low. Consequently, Swisscom has refrained from applying for financial compensation for the first five years of the licence.

[15] While the net cost of the USO is zero, there is clearly a profitability cost of opening the market: Not in regions L and H where the competitive equilibrium remains unchanged, but in region D where market entry degrades the incumbent's profits.

[16] This result is similar to a finding in Jaag et al. (2010) who argue that there are strong path-dependencies in the development of markets. Therefore, legacy costs and benefits need to be taken into account in determining the net cost of the USO.

2.2.2 Non-predetermined Fixed Costs

If costs are not predetermined (i.e. reversible), the situation is slightly different from the situation with predetermined costs. Given the sequence in Figure 1, it is clear from Table 3 that in competition without USO, outcome *({s},{n,e})* is again the only subgame-perfect Nash-equilibrium in pure strategies. Hence, the incumbent is a monopolist in region *L* even if there is no legal monopoly. However, it will not serve region *H* in this case.

The introduction of a universal service obligation again requires the universal service provider (USP) to be present in all regions. Assume first that the incumbent is assigned to be the USP. Then, the USP's payoff is reduced, but the competitive equilibrium allocation is not altered (see Table 3).

If the entrant is the USP by designation, however, the equilibrium is now *({a},{e,e}).* This results from the entrant being able to credibly affirm that it will operate in all markets. Because the incumbent expects a loss in region *L* in this situation, it will not operate there. Hence, in the case that the entrant is the USP, the net cost of the USO is unambiguously equal to $-\pi_{L,M}-\pi_{H,M}$.

	Legal monopoly		Competition		
	no USO	*I* is USP	no USO	*I* is USP	*E* is USP
({s},{e,e}) *({s},{e,n})*	n/a	n/a	$(\pi_{L,D},\pi_{L,D})$	$(\pi_{L,D}+\pi_{H,M},\pi_{L,D})$	$(\pi_{L,D},\pi_{L,D}+\pi_{H,M})$
({s},{n,e}) *({s},{n,n})*	$\boldsymbol{(\pi_{L,M},0)}$	$\boldsymbol{(\pi_{L,M}+\pi_{H,M},0)}$	$\boldsymbol{(\pi_{L,M},0)}$	$\boldsymbol{(\pi_{L,M}+\pi_{H,M},0)}$	n/a
({a},{e,e}) *({a},{n,e})*	n/a	n/a	$(0,\pi_{L,M})$	n/a	$\boldsymbol{(0,\pi_{L,M}+\pi_{H,M})}$
({a},{e,n}) *({a},{n,n})*	*(0,0)*	n/a	*(0,0)*	n/a	n/a

Table 3: Payoffs in regions *L* and *H* with sequential entry without predetermined fixed costs.

If the incumbent is the USP, there are two different possible alternative scenarios on which the correct compensation depends:

- If the alternative to the incumbent's universal service provision is no universal service obligation at all, the net cost of the USO amounts to $-\pi_{H,M}$ which is the incremental loss due to operating in the unattractive region *H*. This is the same net cost as in the case of a legal monopoly.
- If the alternative is the entrant being the USP, the net cost of the USO amounts to $-\pi_{L,M}-\pi_{H,M}$.

Hence, depending on the regulatory alternative, both the incumbent and the entrant may be willing to pay for receiving the USO license as this prevents the other firm's operation in region *L*. This is true iff $\pi_{L,M}+\pi_{H,M}>0$. If this condition does not hold, neither operator has a strategic interest to be designated as USP because the profit of being the sole operator in region *L* is less attractive than the loss from operating in region *H*.

An example for the case of reversible USO fixed costs with sequential entry is the operation of post offices in rural areas. These cause recurrent costs. Closing or replacing them by agencies which are run by third parties would enable incumbent postal operators to considerably reduce costs.[17] The introduction or perpetuation of a universal service obligation, e.g. by an area coverage constraint for some services introduces/prolongs inefficient operations and therefore potentially causes net costs to the universal service provider. However, a firm may be willing to refrain from being compensated because the USO provides it with commitment power in competition. This is similar to sunk costs and the first-mover-advantage (as discussed in Section 2.2.1) serving the same purpose for an incumbent operator. The next section discusses the implications of simultaneous entry decisions where neither firm is a first mover.

2.3 Simultaneous Entry

Even though there usually is an incumbent operator facing one or multiple entrants, in some situations it is more appropriate to model strategic interaction as a non-sequential instead of a sequential game. This is the case if strategic moves are not observable, if moves can be revised without much cost or if new products or services are offered in the market, which are unrelated to other existing offers. In the following, we assume simultaneous entry and no predetermined fixed costs.

In the symmetric case, the entrant's strategy set is reduced to $S^E=\{\{e\},\{n\}\}$ and therefore equivalent to the incumbent's as it can no longer condition its action on the incumbent's behavior (see Figure 2).[18]

[17] See Buser, Jaag, and Trinkner (2008) and Jaag, Koller, and Trinkner (2008) for a recent discussion of the cost of postal outlet networks.
[18] This is the classic 'chicken game', see e.g. Osborne und Rubinstein (1994).

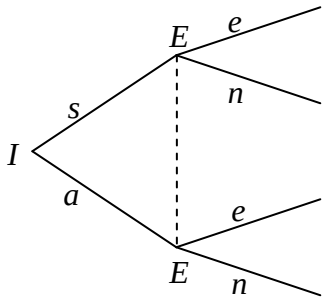

Figure 2: Simultaneous entry in region *L* (payoffs are reported in Table 4).

The payoff-structure with symmetric entry is the same as with sequential entry and no sunk costs. However, in the competitive case with no USO, there are now two Nash-equilibria in pure strategies.[19] Whoever ends up serving region *L* is better off than the other firm. The payoffs are given in Table 4.

The incumbent can no longer count on a first-mover advantage. Rather, it is typically the entrant who is smaller and more innovative who may be able to lock the market in its favor. Facing this situation, each operator has an incentive to move first in order to change the rules and end up in the situation described in Section 2.2.2 above.

	Legal monopoly		Competition		
	no USO	*I* is USP	no USO	*I* is USP	*E* is USP
({s},{e})	n/a	n/a	$(\pi_{L,D}, \pi_{L,D})$	$(\pi_{L,D}+\pi_{H,M}, \pi_{L,D})$	$(\pi_{L,D}, \pi_{L,D}+\pi_{H,M})$
({s},{n})	$\boldsymbol{(\pi_{L,M}, 0)}$	$\boldsymbol{(\pi_{L,M}+\pi_{H,M}, 0)}$	$\boldsymbol{(\pi_{L,M}, 0)}$	$\boldsymbol{(\pi_{L,M}+\pi_{H,M}, 0)}$	n/a
({a},{e})	n/a	n/a	$\boldsymbol{(0, \pi_{L,M})}$	n/a	$\boldsymbol{(0, \pi_{L,M}+\pi_{H,M})}$
({a},{n})	*(0,0)*	n/a	*(0,0)*	n/a	n/a

Table 4: Payoffs in regions *L* and *H* with simultaneous entry.

A typical example for such a situation is entry into the market for physical mail delivery. Usually, more than half of the total delivery costs are fixed (i.e. independent of volume).[20] They result from the postman following a fixed tour and accrue anew with every delivery tour. As the delivery network is built every day from scratch, no operator is able to commit to being in the market (which would be important to prevent the other player from entering). The introduction of

[19] Both operators' duopoly profit is negative, while monopoly profit in the low cost region is positive. There is a symmetric equilibrium in mixed strategies in which both operators are active in the high-cost region with a probability of $-\pi_{L,M}/(\pi_{L,D}-\pi_{L,M})$. Actual outcomes are still represented by the four rows in Table 4. However, with mixed strategies, *({s},{e})* and *({a},{n})* are possible equilibrium outcomes, too.

[20] See e.g. Jaag (2007).

a USO solves this commitment problem. Despite causing inefficient operations by forcing the USP to serve region *H*, being the USP may be attractive.[21]

Compared to the outcome in which the other firm is the USP, each operator gains $\pi_{L,M}+\pi_{H,M}$. In a tender, monopoly rents from operation in region *L* can be skimmed. However, from a policy perspective, the downside of introducing a USO is again the hindrance of competition in this region. This may explain, e.g. in the railway sector, the allocation of USO jointly with the right to operate certain lines exclusively ("franchise bidding").[22]

Compared to the outcome without a USO, the gain of being the USP depends on the relative efficiency of the operators: If the designated USP is less efficient than its competitor, without USO the competitor would be active in region *L*. In this case, the net cost of the USO is equal to $-\pi_{L,M}-\pi_{H,M}$. Hence, if the loss in region *H* is smaller than the profit in region *L* ($\pi_{L,M}+\pi_{H,M}>0$), the designated USP will profit from this designation because it is able to preempt region *L*. However, if the designated USP is more efficient than its competitor, even in the absence of a USO, it would operate in region *L*. In that case, the USO has no commitment value and the net cost is equal to $-\pi_{H,M}$. If both operators are equally efficient, the mixed strategy equilibrium can be considered to be the relevant counterfactual scenario without USO. Expected profits of both operators are then $-(\pi_{L,M})^2/(\pi_{L,D}-\pi_{L,M})$ and the net cost of the USO is $-(\pi_{L,M})^2/(\pi_{L,D}-\pi_{L,M})-\pi_{L,M}-\pi_{H,M}$.

In the postal sector, compensation for the provision of universal services has been paid to various national postal operators.[23] In Austria and Denmark these payments no longer exist[24] while in France[25], Italy[26] and Belgium[27] such compensation still exists. Only at the beginning of 2011 these markets have become fully liberalized. In none of the fully liberalized countries, the USP claims compensa-

[21] Postal markets are usually considered to be contestable because there are no sunk costs, see e.g. Panzar (2002). With a USO, this result is questioned because the USP is not able to exit the market and, therefore, a potential entrant's threat to compete may not be credible.

[22] See e.g. Harstad and Crew (1999).

[23] ITA Consulting and WIK Consulting (2009).

[24] In Austria the compensation paid to Austrian Post ended in 2001 (see Austrian Post, Geschäftsbericht 2001, p.45); in Denmark in 2004 (see Post Danmark, Annual report 2003, p. 15).

[25] In France the government contribution was EUR 242m in 2007 (ARCEP, 2008, Statistical Observatory on Postal Activities in France – 2007, p. 36). However, this public subsidy is not compensation of net cost of the USO, which is solely financed by the monopoly on letter weighing less than 50 grams (until the end of 2010). It compensates the public mission to deliver newspapers throughout the whole country.

[26] Poste Italiane receives a state compensation for losses in universal services and publications delivery. In 2008 it amounted to EUR 706m. The Commission has decided to consider the aid compatible with the EC Treaty. However, "[t]he Commission regrets that Italy put the aid in question into effect, in breach of article 88(3) of the EC Treaty." (European Commission, 2008, State aid n. NN 24/08, p. 19).

[27] See De Post–La Poste, Annual Financial Report 2007, p. 78-79;

tion. In Germany, the postal law foresees an auction to designate the most efficient operator in case universal services are not provided by the market. The mechanism is in place since 2008, when the German postal market was completely opened to competition. So far, the historic incumbent operator Deutsche Post did not change its services in a way that would have resulted in a public need and hence an auction. Hence, Deutsche Post provides universal services without being mandated explicitly and without compensation.[28]

Coming back to the Swiss telecommunications example, Swisscom is not obliged to provide services to customers if another telecommunications services operator offers broadband services to them which are comparable in terms of the speeds and prices specified in the obligations of the universal service license. What looks like an alleviation of the USO may actually result in a higher burden on Swisscom because the USO in this case does not serve as a commitment tool to protect against competition in semi-rural regions.

Hence, in order to prevent the entry-deterring impact of a USO, it may be optimal to confine it to services which would not be offered otherwise, as in the Swiss telecommunications case.

3 Summary and Conclusion

There is a broad literature on strategic entry deterrence, e.g. by according technology and capacity choice. The contribution of this paper is to describe an alternative commitment device and its value in a simplified model framework. The paper argues that universal service obligations may prevent entry in certain regions or market segments by facilitating commitment. A USO allows a firm to have a flexible cost-structure and to fend off competition at the same time. Hence, policy makers face a counter-intuitive challenge when designing universal service obligations: The stricter it is regulated, the more detrimental it may be to competition and therefore the smaller is its burden on the USP.

In the Swiss telecommunications market, the USP is not obliged to provide services to customers if another telecommunications services operator offers these comparable in terms of quality and prices specified in the universal service license. Such a regulation prevents the entry-deterring impact of a USO because it destroys its functioning as a commitment tool. It may therefore be optimal also in other sectors to confine the USO to services which would not be provided otherwise instead of requiring universal services even if some of them are voluntarily offered by competitors.

Our argument also has implications for the costing of the USO and the calculation of the burden it causes. It is important to be aware of the regulatory

[28] Zauner et al. (2008) and Jaag and Trinkner (2009).

alternative because this very much determines the burden of the USP. Further research on this topic may include a more realistic consideration of various dimensions of the USO, the consideration of economies of scope between various regions and the effect of various USO payments to compensate for an unfair burden.

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